

CLAIMS

1. An opening/closing apparatus for automatically releasing/opening two housings which are coupled to each other by a hinge portion and are capable of being opened/closed by manipulating a button, the opening/closing apparatus, comprising:

- a rotary member, having a substantially hollow tubular shape;

- a base, integrally fixed within the rotary member;

- a fixing holder, provided with a through hole along a center axis direction thereof;

- a driving cam portion, including:

 - a rotary cam member, which is engaged with the rotary member and which is slidable only along a shaft direction;

 - a fixing cam member, which is integrally fixed to the fixing holder and is arranged opposite to the rotary member; and

 - a first compression spring, which is elastically provided between the rotary cam member and the base;

- a holding cam portion, including:

 - a lift cam member, which is coupled to the fixing holder;

 - a slide cam member, which is engaged with the base, which is slidable only along the shaft direction, and is arranged opposite to the lift cam member; and

 - a second compression spring, which is elastically provided between the slide cam member and the base, the elastic force of the second compression spring is smaller than that of the first compression spring; and

- a clutch portion, including:

a ball, which is slidably held by the fixing holder along a radial direction on a plane perpendicular to an axis and which engages the rotary cam member at a slidable end thereof; and

a cam shaft, which is slidably held only along the shaft direction by the fixing holder, which has a cam groove engaged with the ball, and which is slid with the slide cam member in an integral manner along the shaft direction.

2. The opening/closing apparatus as set forth in claim 1 wherein:
the rotary cam member includes a retaining portion which is retained by the ball, and the rotary cam is constituted so as to execute such a clutch operation that the rotary cam member is restricted and/or released by entering/deriving the ball into/from the cam groove of the cam shaft.

3. The opening/closing apparatus as set forth in claim 1 wherein:
when both the rotary member and the lift cam member are rotated, since the cam shaft is slid via the slide cam member along the shaft direction, the cam shaft executes such a clutch operation that the rotary cam member is restricted and/or released by entering/deriving the ball into/from the cam groove of the cam shaft.

4. An opening/closing apparatus, comprising:
a rotary member, having a substantially hollow tubular shape;
a base, integrally fixed within the rotary member;
a fixing holder, provided with a through hole along a shaft direction

thereof;

a driving cam portion, including:

a rotary cam member, which is engaged with the rotary member and which is slidable only along a shaft direction;

a first fixing cam member, which is integrally fixed to the fixing holder and is arranged opposite to one cam face of the rotary cam member;

a second fixing cam member, which is engaged with the fixing holder, which is slidable only along the shaft direction, and which is arranged opposite to the other cam face of the rotary cam member; and

a first compression spring, which is elastically provided between the second fixing cam member and the base;

a holding cam portion, including:

a lift cam member, which is coupled to the fixing holder;

a slide cam member, which is engaged with the base, which is slidable only along the shaft direction, and is arranged opposite to the lift cam member; and

a second compression spring, which is elastically provided between the slide cam member and the holder, the elastic force of the second compression spring is smaller than that of the first compression spring; and

a clutch portion, including:

a ball, which is slidably held by the fixing holder along a radial direction on a plane perpendicular to a shaft and which engages the second fixing cam member at a slidable end thereof; and

a cam shaft, which is slidably held only along the shaft direction by the through hole of the fixing holder, which has a cam groove

engaged with the ball, and which is slid with the slide cam member in an integral manner along the shaft direction; and wherein:

the driving cam portion includes two sets of cam members having both the first fixing cam member and the rotary cam member, and both the rotary cam member and the second fixing cam member; and

the driving cam portion provides torque in a wide angle while cams to be meshed with each other are defined as one hill respectively.

5. A portable telephone apparatus, comprising:

the opening/closing apparatus according to any one of claim 1 to 4.